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Amendments to the Specification

1. Please replace the title with the new title.

~~**Interference Scatterometer** v4.0~~

Interferometric Back Focal Plane Scatterometry with Koehler Illumination

2. Please replace the 6th full paragraph on page 3 with the following replacement paragraph:

5,923,423 July 1999 Sawatari et al. 356/484
This is a defect finding system which utilizes a two beam interference design, but is not a ~~Mireau~~ Mirau or Likik configuration. Rather, this system is teaches the use of oblique angles of illumination. Particles are detected by measuring interference between forward scattering and back scattering. The Doppler shift of a moving particle on a wafer is used as a phase shifting mechanism for observing the interference.

3. On page 5 please replace the 1st paragraph following the heading "**BRIEF DESCRIPTION OF THE FIGURES**" with the following replacement paragraph:

Figure 1 is an illustration of a ~~Mireau~~ Mirau interference microscope adapted in accordance with one embodiment of the present invention.

4. On page 5 please replace the 2nd paragraph following the heading "**BRIEF DESCRIPTION OF THE FIGURES**" with the following replacement paragraph:

Figure 2 is a more detailed illustration of the optical reference and object paths of the ~~Mireau~~ Mirau interference microscope shown in Figure 1.

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4. On page 5 please replace the 3rd paragraph following the heading "**BRIEF DESCRIPTION OF THE FIGURES**" with the following replacement paragraph:

Figure 3a is a diagram illustrating specular and non-specular reflection in the optical object path of the ~~Mireau~~ Mirau interference microscope shown in Figure 1.

5. On page 5 please replace the 4th paragraph following the heading "**BRIEF DESCRIPTION OF THE FIGURES**" with the following replacement paragraph:

Figure 3b is a diagram illustrating specular in the optical object path and the optical reference path of the ~~Mireau~~ Mirau interference microscope shown in Figure 1.

6. On page 6 please replace the 1st paragraph following the heading "**DETAILED DESCRIPTION OF THE INVENTION**" with the following replacement paragraph.

Figure 1 is an illustration of a ~~Mireau~~ Mirau interference microscope adapted in accordance the present invention. A light source 10 provides broadband illumination for the microscope. Light source 10 is a highly incoherent luminous source such as an arc lamp or a tungsten halogen lamp. Light source 10 is directed to and imaged on back focal plane 50 of microscope objective lens 60 by condenser lens 20, lenses 30, and beamsplitter 40.

7. On page 6 please replace the 3rd paragraph following the heading "**DETAILED DESCRIPTION OF THE INVENTION**" with the following replacement paragraph.

The optical reference path of the ~~Mireau~~ Mirau interference microscope is shown in Figure 1 and again, in more detail, in Figure 2. The Koehler illumination from back focal plane 50 is imaged by objective lens 60 onto reference mirror 90 after being reflected from ~~Mireau~~ Mirau beamsplitter 80. The optical reference path then reflects again from ~~Mireau~~ Mirau beamsplitter 80, and returns through objective lens 60 to back focal plane 50.

8. On page 6 please replace the 4th paragraph following the heading "**DETAILED DESCRIPTION OF THE INVENTION**" with the following replacement paragraph.

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The optical object path of the ~~Mireau~~ Mirau interference microscope is also shown in Figure 1 and again, in more detail, in Figure 2. As illustrated, Koehler illumination from back focal plane 50 is imaged by objective lens 60 onto object plane 70 after passing through ~~Mireau~~ Mirau beamsplitter 80. The optical object path then returns through ~~Mireau~~ Mirau beamsplitter 80 and objective lens 60 to back focal plane 50.

9. On page 8 please replace the 4th paragraph with the following replacement paragraph.

Other types of interference microscopes can also be adapted in accordance with the present invention. For high numerical aperture applications, the two most suitable interference microscope types are the Linnik microscope and the ~~Mireau~~ Mirau microscope. A ~~Mireau~~ Mirau interference microscope adapted in accordance with the present invention has been described in detail.

10. On page 9 please replace the 3rd paragraph with the following replacement paragraph.

The ~~Mireau~~ Mirau and Linnik interference microscopes have been illustrated with polarizing filters. Polarizing filter 30 is positioned in the illumination path. Polarizing filter 105 is positioned between the back-focal-plane of the objective lens and video camera 110. This allows for measurement of the dependence of reflectivity and complex phase as a function of polarization.

11. On pages 9-10 please replace the 2nd paragraph following the heading **"MATHEMATICAL ANALYSIS"** with the following replacement paragraph.

In the ~~Mireau~~ Mirau embodiment (Figure 1) the image captured by the video camera is that of the back focal plane of the single objective lens. In the Linnik embodiment (Figure 7) the image captured by the video camera is the common back focal plane images of the two objective lenses. In either a ~~Mireau~~ Mirau or Linnik embodiments, the electric field captured by the video camera may be written as a sum or superposition of two electric fields: E_o which comes from light which has traveled through the object channel and E_r which comes from light which has traveled through the reference channel. Both are functions of space and time coordinates:

12. On page 10 please replace the 1st full paragraph with the following replacement paragraph.

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In the case of the ~~Mireau~~ Mirau embodiment the object and reference channels both share the same microscope objective lens, whereas in the Linnik design they each have their own distinct microscope objective lens. Other than this physical difference, the two systems are theoretically identical is most respects relevant to the present invention. I use complex notation for the electric fields as is customary in optical literature with the understanding that it is the real part of the field quantities that is the true physical electric field. I shall discuss only the electric fields since the magnetic fields may be derived from the electric fields by using the field equations - Maxwell's equation.

13. On page 15 please replace the 1st full paragraph with the following replacement paragraph.

For the ~~Mireau~~ Mirau system alternate embodiments include moving any combination of reference mirror, object, and ~~Mireau~~ Mirau beamsplitter (the one between the reference mirror and the object) to achieve a path-length difference for use in Fourier transform spectroscopy.

14. On page 15 please replace the 5th full paragraph with the following replacement paragraph.

The preferred embodiment of the present invention has been taught in the form of high-NA Linnik and ~~Mireau~~ Mirau interference microscopes. However other types of interference microscopes could be adapted in accordance with the teachings herein. Further still, the location of certain optical elements, such as the beamsplitter, could be varied and various adaptations of the interference microscopes could be implemented to vary the path-length differences in alternative ways without departing from the teachings of the invention.